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## Test 717: John Deere 440 ID Diesel

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# NEBRASKA TRACTOR TEST 717 - JOHN DEERE 440 ID DIESEL

The University of Nebraska Agricultural Experiment Station

W. V. Lambert, Director; Lincoln, Nebraska

## POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of mercury
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
32.70	1850	2.268	0.486	14.42	171	64	75	29.267
Standard Power Take-off Speed (540 rpm)—One Hour								
31.22	1785	2.180	0.489	14.32	171	64	75	29.275
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
28.61	1904	2.072	0.508	13.81	160	64	76	.....
1.02	1979	0.895	6.147	1.14	144	63	73	.....
14.49	1929	1.374	0.665	10.55	150	62	72	.....
32.42	1853	2.243	0.485	14.45	163	63	74	.....
7.39	1962	1.121	1.064	6.59	147	63	74	.....
21.60	1915	1.712	0.556	12.62	153	62	72	.....
Av 17.59	1922	1.569	0.625	11.21	153	63	73	29.268

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	Fuel Consumption		Hp-hr per gal	Temp. Degrees F	Air wet bulb	Air dry bulb	Barometer inches of mercury
					Gal per hr	Lb per hp-hr		Cooling med			
<b>VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST</b>											
<b>Maximum Available Power—Two Hours—3rd Gear</b>											
26.68	1976	5.06	1836	4.47	2.182	0.573	12.23	170	60	78	28.943
<b>75% of Pull at Maximum Power—Ten Hours—3rd Gear</b>											
21.90	1541	5.33	1900	2.87	1.905	0.610	11.50	158	57	73	28.741
<b>50% of Pull at Maximum Power—Two Hours—3rd Gear</b>											
15.30	1052	5.45	1924	1.92	1.575	0.721	9.71	156	60	83	28.860
<b>MAXIMUM POWER WITH BALLAST</b>											
20.86	4362	1.79	1906	14.73	1st Gear.....		155	56	68		28.970
27.11	2714	3.75	1852	6.50	2nd Gear.....		155	50	55		28.955
27.51	2019	5.11	1855	4.66	3rd Gear.....		153	50	53		28.950
27.06	1520	6.68	1844	3.51	4th Gear.....		154	53	58		28.955
23.77	691	12.90	1848	1.62	5th Gear.....		154	57	69		28.960
<b>MAXIMUM POWER WITHOUT BALLAST</b>											
25.96	1988	4.90	1852	9.91	3rd Gear.....		169	61	85		28.700
<b>VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear</b>											
Pounds pull	2000	2100	2150	2150	2100	2200	2100				
Horsepower	27.5	25.2	22.9	20.1	16.8	14.7	11.2				
Miles per hour	5.1	4.5	4.0	3.5	3.0	2.5	2.0				

Department of Agricultural Engineering  
 Dates of Test: September 9 to September 19, 1959.  
 Manufacturer: JOHN DEERE DUBUQUE TRACTOR WORKS, DUBUQUE, IOWA  
 Manufacturer's Power Rating: Not Rated

**FUEL, OIL and TIME** Fuel No 2 diesel Cetane No 51 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8418 Weight per gallon 7.009 lb Oil SAE 30 API service classification ML, MM, MS, DG and DM To motor 2.024 gal Drained from motor 1.729 gal Transmission and final-drive lubricant SAE No 80 Type multi-purpose lubricant Total time motor was operated 34 hours.

**ENGINE** Makac General Motors 2 cycle Diesel Type 2 cylinder with blower Serial No 2D 3353 Crankshaft mounted lengthwise Rated rpm 1850 Lubrication pressure Bore and stroke 3 1/8" x 4 1/2" Compression ratio 17 to 1 Displacement 106.1 cu in Cranking system 12 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter full flow replaceable paper element Fuel filter yarn wound replaceable element Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No 453282 Tread width rear 60" front 56" Wheel base 85" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 36.2" Vertical distance above roadway 29.3" Horizontal distance from center of rear wheel tread 0.4" to the left Hydraulic control system direct engine drive Advertised speeds mph first 2.00 second 3.93 third 5.25 fourth 6.82 fifth 12.93 reverse 2.91 Belt pulley diam 9 1/16" face 6 3/8" rpm 1267 Belt speed 3006 fpm Clutch single plate dry disc operated by foot pedal Brakes disc brakes operated by two foot pedals Power take-off 559 rpm at 1850 engine rpm Steering power assisted Turning radius (on concrete surface with brake applied) right 123" left 123" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 255" left 255" (on concrete surface without brake) right 287" left 287".

**REPAIRS AND ADJUSTMENTS** No repairs or adjustments.

**REMARKS** All test results were determined from observed data obtained in accordance with SAE and ASAE test code.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No 717. ASAE test code.

L. F. LARSEN  
 Engineer-in-Charge

L. W. HURLBUT  
 G. W. STEINBRUEGGE  
 J. J. SULEK  
 Board of Tractor  
 Test Engineers

TIRES, BALLAST and WEIGHT		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-28;4;14	Two 13.6-28;4;14
Ballast	—Liquid	441 lb each	None
	—cast iron	536 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16;6;28	Two 6.00-16;6;28
Ballast	—Liquid	None	None
	—cast iron	None	
Height of drawbar		15 inches	16 1/2 inches
Static weight	—Rear	4456 lb	2502 lb
	—Front	1744 lb	1744 lb
Total weight with operator		6375 lb	4421 lb



## EXPLANATION OF TEST REPORT

### GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

### PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

### BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  the 85% torque; maximum power;  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

### DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Power Without Ballast.** All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions; (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



John Deere 440 ID Diesel